(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 April 2002 (04.04.2002)

PCT

(10) International Publication Number
WO 02/26268 A2

(51) International Patent Classification[7]: A61L

(21) International Application Number: PCT/GB01/04323

(22) International Filing Date:
27 September 2001 (27.09.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0023898.0 29 September 2000 (29.09.2000) GB

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 02/26268 A2

(54) Title: HARD SURFACE CLEANING AND DISINFECTING COMPOSITIONS

(57) Abstract: Aqueous disinfecting and cleaning compositions and concentrates which are efficacious against gram positive and gram negative bacteria, have relatively low volatile organic content ("VOC") and are surprisingly mild to user of the compositions. The compositions include a quaternary ammonium compound as its primary germicidal active agent, and have a low content of active constituents.

HARD SURFACE CLEANING AND DISINFECTING COMPOSITIONS

The present invention relates to improvements in cleaning compositions. More particularly the present invention is directed to improved cleaning compositions which find particular use in hard surface cleaning and disinfecting applications.

Background of the Invention

Compositions that both clean and disinfect hard surfaces are known in the art. These compositions, in many instances, contain quaternary ammonium compounds as the active disinfectant, and nonionic surfactants as cleaning agents. Examples of such compositions may be found in United States Patent No. 5,454,984 to Graubart *et al.* and United States Patent No. 5,522,942 to Graubart *et al.* These compositions are generally directed to a combination of quaternary ammonium compounds, a defined mixture of non-ionic surfactants, and a glycol ether solvent. In both Graubart *et al.* patents, the number of carbon atoms in those non-ionic surfactants which are ethoxylated alcohols range from 10 to 20 carbon atoms, preferably from 11 to 15 carbon atoms in the alcohol portion which is combined with the ethylene oxide.

Others have investigated the use of quaternary ammonium compounds with ethoxylated alcohols of varying carbon chain lengths. For example, United States Patent No. 4,109,010 to Sias discloses a range of about 10 to 16 carbon atoms, but expresses no preference to the number of carbon atoms. United States Patent No. 4,065,409 to Flanagan discloses a range of from about 10 to about 20 carbon atoms, preferably from about 12 to 16 carbon atoms. United States Patent No. 5,798,329 to Taylor, although directed to a liquid laundry composition containing quaternary ammonium compounds, and not to a hard surface cleaner, discloses non-ionic surfactants which include alcohol ethoxylates having 8 to 18 carbon atoms in the alkyl moiety with 10 to 14 carbon atoms being preferred. United States Patent No. 4,597,887

to Colodney is directed to a germicidal hard surface cleaning composition comprising a quaternary ammonium salt and an ethyleneoxylated nonionic detergent. The nonionic detergents include the condensation products of a higher alkanol containing about 8 to 18 carbon atoms in a straight- or branched-chain configuration condensed with about 5 to 30 moles of ethylene oxide. Mentioned therein are preferred examples of these detergents such as condensates of C_9 -C_{11} alkanol with 2.5 moles of ethylene oxide, condensates of C_{12} -C_{13} alkanol with 6.5 moles of ethylene oxide and condensates of C_{10} -C_{12} alkanol with about 60% by weight of ethylene oxide.

Notwithstanding any advantages which may be disclosed in the known art formulations, there remains a real and continuing need in the art for improved cleaning and disinfecting compositions in general, and in specific such compositions which provide good santiziation or disinfection of hard surfaces together with good cleaning but at the same time using lower amounts of active ingredients in an aqueous formulation.

The compositions of the invention are aqueous disinfecting and cleaning compositions and concentrates thereof which are effective cleaning compositions and are efficacious as disinfecting compositions against gram positive and gram negative bacteria and are mild to the user of the compositions. That these results are concurrently achieved with a composition which includes a cationic surfactant having germicidal properties, for example, quaternary ammonium compounds, as its primary germicidal active agent is surprising, and indicates a synergistic effect not apparent from the prior art. These compositions also provide good cleaning and disinfecting properties with low amounts of active constituents, and according to certain preferred embodiments the inventive do not include organic solvents such as low molecular weight alcohols, glycols or glycol ethers, in significant amounts, i.e., amounts in excess of about 1% wt.

Summary of the Invention

The present invention provides an aqueous composition comprising (preferably consisting essentially of):

at least one cationic surfactant having germicidal properties;

at least one non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant;

optionally, up to about 5% wt. of one or more conventional additives selected from coloring agents, fragrances and fragrance solubilizers, viscosity modifying agents, other non-short chain non-ionic surfactants, other antimicrobial/germicidal agents, pH adjusting agents and pH buffers including organic and inorganic salts, non-aqueous solvents, optical brighteners, opacifying agents, hydrotropes, antifoaming agents, enzymes, anti-spotting agents, anti-oxidants, and anti-corrosion agents; and,

water to form 100% wt. of said composition.

Preferably, the at least one cationic surfactant having germicidal properties is present in an amount of from about 0.001 to about 10% wt. and the at least one non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant is present in an amount of from about 0.01 to about 10% wt. Preferably, the non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant is selected from C_6 -C_{11} linear alcohol ethoxylate having from about 1 to about 6 moles of ethylene oxide.

The aqueous composition of the present invention for use on hard surfaces can be formulated as a ready to use composition which can be used as is by the consumer or as a concentrated composition which can be diluted in water by the consumer prior to use. In either instance, the composition provides disinfection of the hard surface to which it is applied and has good cleaning properties.

In a further aspect of the invention there is provided a process for cleaning and/or disinfecting surfaces in need of such treatment which includes contacting a surface with the compositions, in either ready to us or concentrate which is later diluted, as taught herein.

Brief description of the Drawings

Figure 1 shows the effect of non-ionic surfactants on the efficacy of benzylalkonium chloride quaternary versus *Salmonella choleraesuis* at two concentrations (210 ppm, • • • • • ; 450 ppm, — — —) of quaternary. ◊ refers to a C_{6-10}

non-ionic surfactant; △ refers to C_{8-10} non-ionic surfactant; ▽ refers to a C_{11} non-ionic surfactant; and refers to a C_{12-16} non-ionic surfactant. When referring to a, for example, C_{6-10} non-ionic surfactant, the C_{6-10} refers to the number of carbon atoms in the non-polar hydrophobic portion of the surfactant.

Detailed Description of the Invention

The present invention provides an aqueous composition comprising (preferably consisting essentially of):

at least one cationic surfactant having germicidal properties;

at least one non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant;

optionally, up to about 5% wt. of one or more conventional additives selected from coloring agents, fragrances and fragrance solubilizers, viscosity modifying agents, other non-short chain non-ionic surfactants, other antimicrobial/germicidal agents, pH adjusting agents and pH buffers including organic and inorganic salts, non-aqueous solvents, optical brighteners, opacifying agents, hydrotropes, antifoaming agents, enzymes, anti-spotting agents, anti-oxidants, and anti-corrosion agents; and,

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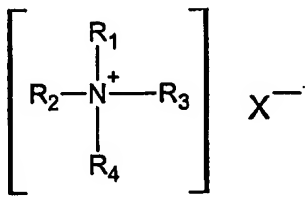
use. In either instance, the composition provides disinfection of the hard surface to which it is applied and has good cleaning properties.

In a further aspect of the invention there is provided a process for cleaning and/or disinfecting surfaces in need of such treatment which includes contacting a surface with the compositions, in either ready to us or concentrate which later diluted, as taught herein.

The inventive compositions necessarily include at least one cationic surfactant having germicidal properties which provides a primary sanitizing benefit to the compositions.

Particularly preferred for use as the cationic surfactant which is found to provide a broad antibacterial or sanitizing function are well known, and useful cationic surfactants may be one or more of those described in, for example, *McCutcheon's Detergents and Emulsifiers,* North American Edition, 2000; *Kirk-Othmer, Encyclopedia of Chemical Technology,* 4th Ed., Vol. 23, pp. 478-541, the contents of which are herein incorporated by reference.

Examples of preferred cationic surfactant compositions useful in the practice of the instant invention are those which provide a germicidal effect to the concentrate compositions, and especially preferred are quaternary ammonium compounds and salts thereof, which may be characterized by the general structural formula:

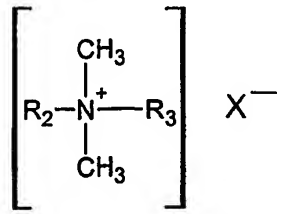


where at least one of R_1, R_2, R_3 and R_4 is an alkyl, aryl or alkylaryl substituent of from 6 to 26 carbon atoms, and the entire cation portion of the molecule has a molecular weight of at least 165. The alkyl substituents may be long-chain alkyl, long-chain alkoxyaryl, long-chain alkylaryl, halogen-substituted long-chain alkylaryl, long-chain

alkylphenoxyalkyl, arylalkyl, etc. The remaining substituents on the nitrogen atoms other than the above mentioned alkyl substituents are hydrocarbons usually containing no more than 12 carbon atoms. The substituents R_1, R_2, R_3 and R_4 may be straight-chained or may be branched, but are preferably straight-chained, and may include one or more amide, ether or ester linkages. The counterion X may be any salt-forming anion which permits water solubility of the quaternary ammonium complex.

Exemplary quaternary ammonium salts within the above description include the alkyl ammonium halides such as cetyl trimethyl ammonium bromide, alkyl aryl ammonium halides such as octadecyl dimethyl benzyl ammonium bromide, N-alkyl pryridinium halides such as N-cetyl pyridinium bromide, and the like. Other suitable types of quaternary ammonium salts include those in which the molecule contains either amide, ether or ester linkages such as octyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride, N-(laurylcocoaminoformylmethyl)-pyridinium chloride, and the like. Other very effective types of quaternary ammonium compounds which are useful as germicides include those in which the hydrophobic radical is characterized by a substituted aromatic nucleus as in the case of lauryloxyphenyltrimethyl ammonium chloride, cetylaminophenyltrimethyl ammonium methosulfate, dodecylphenyltrimethyl ammonium methosulfate, dodecylphenyltrimethyl ammonium chloride, chlorinated dodecylbenzyltrimethyl ammonium chloride, and the like.

Preferred quaternary ammonium compounds which act as germicides and which are found to be useful in the practice of the present invention include those which have the structural formula:



wherein R_2 and R_3 are the same or different C_8-C_{12} alkyl, or R_2 is C_{12-16} alkyl, C_{8-18}alkylethoxy, C_{8-18}alkylphenoxyethoxy and R_3 is benzyl, and X is a halide, for example chloride, bromide or iodide, or is a methosulfate or saccharinate anion. The alkyl groups

recited in R_2 and R_3 may be straight-chained or branched, but are preferably substantially linear.

Particularly useful quaternary germicides include compositions which include a single quaternary compound, as well as mixtures of two or more different quaternary compounds. Such useful quaternary compounds are available under the BARDAC®, BARQUAT®, HYAMINE®, LONZABAC®, BTC®, and ONYXIDE® trademarks, which are more fully described in, for example, *McCutcheon's Functional Materials* (Vol. 2), North American Edition, 1998, and the respective product literature from the suppliers identified below. For example, BARDAC® 205M is described to be a liquid containing alkyl dimethyl benzyl ammonium chloride, octyl decyl dimethyl ammonium chloride; didecyl dimethyl ammonium chloride, and dioctyl dimethyl ammonium chloride (50% active) (also available as 80% active (BARDAC® 208M)); described generally in *McCutcheon's* as a combination of alkyl dimethyl benzyl ammonium chloride and dialkyl dimethyl ammonium chloride); BARDAC® 2050 is described to be a combination of octyl decyl dimethyl ammonium chloride/didecyl dimethyl ammonium chloride, and dioctyl dimethyl ammonium chloride (50% active) (also available as 80% active (BARDAC® 2080)); BARDAC® 2250 is described to be didecyl dimethyl ammonium chloride (50% active); BARDAC® LF (or BARDAC® LF-80), described as being based on dioctyl dimethyl ammonium chloride (BARQUAT® MB-50, MX-50, OJ-50 (each 50% liquid) and MB-80 or MX-80 (each 80% liquid) are each described as an alkyl dimethyl benzyl ammonium chloride; BARDAC® 4250 and BARQUAT® 4250Z (each 50% active) or BARQUAT® 4280 and BARQUAT® 4280Z (each 80% active) are each described as alkyl dimethyl benzyl ammonium chloride/alkyl dimethyl ethyl benzyl ammonium chloride. Also, HYAMINE® 1622, described as diisobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride (available either as 100% actives or as a 50% actives solution); HYAMINE® 3500 (50% actives), described as alkyl dimethyl benzyl ammonium chloride (also available as 80% active (HYAMINE® 3500-80); and HYAMINE® 2389 described as being based on methyldodecylbenzyl ammonium chloride and/or methyldodecylxylene-bis-trimethyl ammonium chloride. (BARDAC®, BARQUAT® and HYAMINE® are presently commercially available from Lonza, Inc., Fairlawn, NJ). BTC® 50 NF (or BTC® 65 NF) is described to be alkyl dimethyl benzyl ammonium chloride (50% active); BTC® 99 is described as didecyl dimethyl ammonium chloride (50% active); BTC® 776 is described to be myristalkonium chloride (50%

active); BTC® 818 is described as being octyl decyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, and dioctyl dimethyl ammonium chloride (50% active) (available also as 80% active (BTC® 818-80%)); BTC® 824 and BTC® 835 are each described as being of alkyl dimethyl benzyl ammonium chloride (each 50% active); BTC® 885 is described as a combination of BTC® 835 and BTC® 818 (50% active) (available also as 80% active (BTC® 888)); BTC® 1010 is described as didecyl dimethyl ammonium chloride (50% active) (also available as 80% active (BTC® 1010-80)); BTC® 2125 (or BTC® 2125 M) is described as alkyl dimethyl benzyl ammonium chloride and alkyl dimethyl ethylbenzyl ammonium chloride (each 50% active) (also available as 80% active (BTC® 2125-80 or BTC® 2125 M)); BTC® 2565 is described as alkyl dimethyl benzyl ammonium chlorides (50% active) (also available as 80% active (BTC® 2568)); BTC® 8248 (or BTC® 8358) is described as alkyl dimethyl benzyl ammonium chloride (80% active) (also available as 90% active (BTC® 8249)); ONYXIDE® 3300 is described as n-alkyl dimethyl benzyl ammonium saccharinate (95% active). (BTC® and ONYXIDE® are presently commercially available from Stepan Company, Northfield, IL). Polymeric quaternary ammonium salts based on these monomeric structures are also considered desirable for the present invention. One example is POLYQUAT®, described as being a 2-butenyldimethyl ammonium chloride polymer.

The cationic surfactant having germicidal properties may be present in any effective amount, but generally need not be present in amounts in excess of about 10% wt. based on the total weight of the composition. The preferred germicidal cationic surfactant(s) may be present in the liquid disinfectant compositions in amounts of from about 0.001 % by weight to up to about 10% by weight, preferably about 0.01 -8% by weight, most preferably in amount of between 0.5-6 % by weight. It is particularly advantageous that the preferred germicidal cationic surfactant(s) are present in amounts of at least 200 parts per million (ppm), preferably in amounts of 200 - 700 ppm, more preferably in amounts of from 200 - 500 ppm.

A further constituent in the compositions of the present invention is a short chain non-ionic surfactant. The short chain non-ionic surfactant is one which has from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant.

Examples of short chain non-ionic surfactants include linear alcohol ethoxylates. The linear alcohol ethoxylates which may be employed in the present invention are generally the C_6 -C_{11} straight-chain alcohols which are ethoxylated with from about 3 to about 6 moles of ethylene oxide. Their derivation is well known in the art. Examples include Alfonic® 810-4.5, which is described in product literature from Condea Vista as having an average molecular weight of 356, an ethylene oxide content of about 4.85 moles (about 60 wt.%), and an HLB of about 12; Alfonic® 810-2, which is described in product literature from Condea Vista as having an average molecular weight of 242, an ethylene oxide content of about 2.1 moles (about 40 wt.%), and an HLB of about 12; and Alfonic® 610-3.5, which is described in product literature from Condea Vista as having an average molecular weight of 276, an ethylene oxide content of about 3.1 moles (about 50 wt.%), and an HLB of 10. Product literature from Condea Vista also identifies that the numbers in the alcohol ethoxylate name designate the carbon chain length (numbers before the hyphen) and the average moles of ethylene oxide (numbers after the hyphen) in the product.

Other examples of ethoxylated alcohols include the Neodol® 91 series non-ionic surfactants available from Shell Chemical Company which are described as C_9-C_{11} ethoxylated alcohols. The Neodol® 91 series non-ionic surfactants of interest include Neodol 91-2.5, Neodol 91-6, and Neodol 91-8. Neodol 91-2.5 has been described as having about 2.5 ethoxy groups per molecule; Neodol 91-6 has been described as having about 6 ethoxy groups per molecule; and Neodol 91-8 has been described as having about 8 ethoxy groups per molecule.

Further examples of ethoxylated alcohols include the Rhodasurf® DA series non-ionic surfactants available from Rhodia which are described to be branched isodecyl alcohol ethoxylates. Rhodasurf DA-530 has been described as having 4 moles of ethoxylation and an HLB of 10.5; Rhodasurf DA-630 has been described as having 6 moles of ethoxylation with an HLB of 12.5; and Rhodasurf DA-639 is a 90% solution of DA-630.

Further examples of short chain non-ionic surfactants contemplated include C_8-C_{10} alkyl polyglycosides which are available under the Glucopon trademark from Cognis.

These surfactants include Glucopon 225, 225DK, 225CS, and 225CSUP, described as C_8-C_{10} alkyl polysaccharide ether.

Another example of a short chain non-ionic surfactant includes a C_9/C_{11}-oxoalcohol polyglycol ether with 7 moles of ethylene oxide, available as Genapol UD-079 from Clariant.

The short chain non-ionic surfactant may be present in any effective amount, but generally need not be present in amounts in excess of about 10% wt. based on the total weight of the composition. The short chain non-ionic surfactant is preferably present in the liquid disinfectant compositions in amounts of from about 0.01 % by weight to up to about 10% by weight, preferably about 0.01 -5% by weight, and most preferably in amount of between 0.5 - 3 % by weight.

Other conventional optional additives, although not particularly elucidated herein may also be included in the present inventive compositions in order to provide esthetic or other beneficial properties thereto. Exemplary optional conventional additives include but are not limited to: other non-short chain non-ionic surfactants; other antimicrobial/germicidal agents, pH adjusting agents and pH buffers including organic and inorganic salts; non-aqueous solvents, fragrances, fragrance solubilizers, optical brighteners, coloring agents such as dyes and pigments, opacifying agents, hydrotropes, antifoaming agents, viscosity modifying agents such as thickeners, enzymes, anti-spotting agents, anti-oxidants, anti-corrosion agents as well as others not specifically elucidated here. These should be present in minor amounts, preferably in total comprise less than about 5% by weight of the compositions, and desirably less than about 3% wt. The optional ingredients chosen should be compatible with the compositions to which they are added and the compatibility can be easily determined by one of ordinary skill in the art.

Examples of other non-short chain non-ionic surfactants which may be present in minor amounts in the inventive compositions can include alkoxy block copolymers, and in particular, compounds based on ethoxy/propoxy block copolymers. Polymeric alkylene oxide block copolymers include non-ionic surfactants in which the major portion of the molecule is made up of block polymeric C_2-C_4 alkylene oxides. Such non-short

chain non ionic surfactants, while preferably built up from an alkylene oxide chain starting group, and can have as a starting nucleus almost any active hydrogen containing group including, without limitation, amides, phenols, thiols and secondary alcohols. When used herein, non-short chain non-ionic surfactants mean those surfactants which have greater than eleven carbon atoms in the non-polar hydrophobic portion of the surfactant.

One example are those non-short chain nonionic surfactants which contain alkylene oxide blocks and which may be represented by the formula (A):

$$HO\text{-}(EO)_x(PO)_y(EO)_z\text{-}H \qquad (A)$$

where EO represents ethylene oxide,
PO represents propylene oxide,
y equals at least 15,
$(EO)_{x+y}$ equals 20 to 50% of the total weight of said compounds, and, the total molecular weight is preferably in the range of about 2000 to 15,000.

Another example are those non-short chain nonionic surfactants which can be represented by the formula (B):

$$R\text{-}(EO,PO)_a(EO,PO)_b\text{-}H \qquad (B)$$

wherein R is an alkyl, aryl or aralkyl group, where the R group contains 1 to 20 carbon atoms, the weight percent of EO is within the range of 0 to 45% in one of the blocks a, b, and within the range of 60 to 100% in the other of the blocks a, b, and the total number of moles of combined EO and PO is in the range of 6 to 125 moles, with 1 to 50 moles in the PO rich block and 5 to 100 moles in the EO rich block.

Further non-short chain nonionic surfactants which in general are encompassed by Formula B include butoxy derivatives of propylene oxide/ethylene oxide block polymers having molecular weights within the range of about 2000-5000.

Another example are those non-short chain nonionic surfactants which contain polymeric butoxy (BO) groups and which can be represented by formula (C) as follows:

$$RO\text{-}(BO)_n(EO)_x\text{-}H \qquad (C)$$

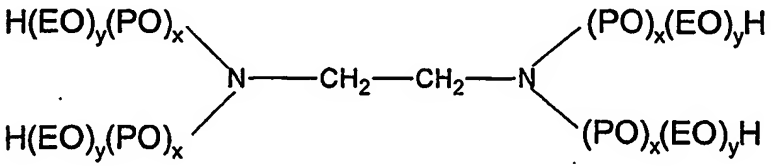
wherein R is an alkyl group containing I to 20 carbon atoms,
n is about 5-15 and x is about 5-15.

Another example are those non-short chain nonionic surfactants may be represented by the following formula (D):

$$HO\text{-}(EO)_x(BO)_n(EO)_y\text{-}H \qquad (D)$$

wherein n is about 5-15, preferably about 15,
x is about 5-15, preferably about 15, and
y is about 5-15, preferably about 15.

Another example are those non-short chain nonionic surfactants include ethoxylated derivatives of propoxylated ethylene diamine, which may be represented by the following formula:



(E)

where (EO) represents ethoxy,
(PO) represents propoxy,
the amount of $(PO)_x$ is such as to provide a molecular weight prior to ethoxylation of about 300 to 7500, and the amount of $(EO)_y$ is such as to provide about 20% to 90% of the total weight of said compound.

If such other non-short chain non-ionic surfactants are to be included in minor amounts, a preferred other non-short chain non-ionic surfactant is represented by formula (A) above; specific examples of which include those materials presently commercially available under the tradename "Pluronic®", and in particular the Pluronic® F series, Pluronic® L series, Pluronic® P series, as well as in the Pluronic® R series, each of which are generally described to be block copolymers of propylene oxide and ethylene oxide. Generally those of the Pluronic® L series and the Pluronic® R series are preferred as these are supplied in liquid form by the manufacturer and are readily formulated into the present inventive compositions. These are also available in a wide range of HLB values, and those having HLB values in the range of 1.0-23.0 may be used, although those with intermediate HLB values such as from about 12.0-18.0 are found to be particularly advantageous. These materials are presently commercially available from BASF AG (Ludwigshafen, Germany) as well as from BASF Corp. (Mt. Olive Township, New Jersey).

Other examples of non-short chain non-ionic surfactants which may be included in minor amounts, based on a polymeric ethoxy/propoxy units, include those presently commercially available in the PolyTergent® E, and PolyTergent® P series of materials from BASF Corp. (Mt. Olive, NJ). These are described to be nonionic surfactants based on ethoxy/propoxy block copolymers, conveniently available in a liquid form from its supplier.

Other examples of non-short chain non-ionic surfactants which may be included in minor amounts include alkoxylated alcohols wherein the non-polar portion of the surfactant contains greater than eleven carbon atoms . These include the condensation products of a higher alcohol (e.g., an alkanol containing about 12 to 18 carbon atoms in a straight or branched chain configuration) condensed with about 2 to 30 moles of ethylene oxide, for example, lauryl or myristyl alcohol condensed with about 16 moles of ethylene oxide, tridecanol condensed with about 6 to moles of ethylene oxide, myristyl alcohol condensed with about 10 moles of ethylene oxide per mole of myristyl alcohol.

Some examples of the foregoing non-short chain non-ionic surfactants include certain Neodol® ethoxylates (Shell Chemical Co., Houston Tex) such as C_{12-13} alkanol condensed with 6.5 moles ethylene oxide (Neodol® 23-6.5), C_{12-13} alkanol condensed

with 7 moles ethylene oxide Neodol® 23-7); C_{12-15} alkanol condensed with 7 moles of ethylene oxide (Neodol® 25-7), C_{12-15} alkanol condensed with 9 moles ethylene oxide (Neodol® 25-9), C_{12-15} alkanol condensed with 12 moles ethylene oxide (Neodol® 25-12), C_{14-15} alkanol condensed with 13 moles ethylene oxide (Neodol® 45-13), and the like.

Other possible non-short chain non-ionic surfactants which can be used in minor amounts in the inventive compositions are those presently marketed under the Genapol® tradename. Particularly useful are those in the Genapol® "26-L" series which include for example: C_{12-16} linear alcohols condensed with 1 mole of ethylene oxide (Genapol® 26-L-3); C_{12-16} linear alcohols condensed with 1.6 moles of ethylene oxide (Genapol® 26-L-1.6); C_{12-16} linear alcohols condensed with 2 moles of ethylene oxide (Genapol® 26-L-2); C_{12-16} linear alcohols condensed with 3 moles of ethylene oxide (Genapol® 26-L-3); C_{12-16} linear alcohols condensed with 5 moles of ethylene oxide (Genapol® 26-L-5); as well as C_{12-16} linear alcohols condensed with varying amounts of ethylene oxide to provide specific cloud points of the surfactant (i.e., Genapol® 26-L-60, Genapol® 26-L-60N, and Genapol® 26-L-98N). These materials are commercially available from a variety of sources, including Clariant Corp. (Charlotte, N.C.).

Other possible non-short chain non-ionic surfactants which can be used in minor amounts in the inventive compositions include those based on alcohol and ethylene oxide condensates of a secondary aliphatic alcohol. These alcohols contain 12 to 18 carbon atoms in a straight or branched chain configuration and are condensed with 5 to 30 moles of an alkylene oxide, especially ethylene oxide. Examples of commercially available nonionic detergents of the foregoing type are C_{11-15} secondary alkanols condensed with either 9 ethylene oxides (Tergitol® 15-S-9) or 7 ethylene oxides (Tergitol® 15-S-7) marketed by Union Carbide Corp. (Danbury Conn.). It is to be understood that these nonionic alkoxylated secondary alcohol surfactant compounds may be used singly or in mixtures of two or more such compounds.

Other possible non-short chain non-ionic surfactants which can be used in minor amounts in the inventive compositions include certain alkoxylated linear aliphatic alcohol surfactants which are believed to be the condensation products of a C_{8-10} hydrophilic moiety with alkylene oxides, especially polyethylene oxide and or polypropylene oxide

moieties. Such alkoxylated linear alcohol surfactants are presently commercially available under the tradename PolyTergent® (Olin Chemical Co., Stamford Conn.). Of these particularly useful are those which are marketed as PolyTergent® SL-22, PolyTergent® SL-42, PolyTergent® SL-62 and PolyTergent® SL-29, of which PolyTergent® SL-62 is particularly advantageous. PolyTergent® SL-92 is described as being a moderately foaming, biodegradable alkoxylated linear alcohol surfactant having on average 8 moles of oxyethylene groups per molecule. These alkoxylated linear alcohol surfactants provide good detersive action in the removal of many types of fats and greases such as are frequently found in soils on hard surfaces, as well as providing a further solubilizing effects and may be included in the concentrate compositions according to the present invention with advantage. The preferred alkoxylated linear alcohol surfactants should also exhibit low levels of ocular irritation in the concentrate compositions.

The inventive compositions optionally but desirably can include in minor amounts a builder. Such include water soluble inorganic builders which can be used alone, in admixture with other water soluble inorganic builders, as well as in conjunction with one or more organic alkaline sequestrant builder salts. Exemplary builders include alkali metal carbonates, phosphates, polyphosphates and silicates. More specific examples include sodium tripolyphosphate, sodium carbonate, sodium bicarbonate, sodium borates, potassium carbonate, sodium polyphosphate, potassium pyrophosphate, potassium tripolyphosphate, and sodium hexametaphosphate. Further exemplary builders also include organic alkaline sequestrant builder salts such as alkali metal polycarboxylates including water-soluble citrates such as sodium and potassium citrate, sodium and potassium tartarate, sodium and potassium ethylenediaminetetraacetate, sodium and potassium N-(2-hydroxyethyl)-ethylene diamine triacetates, sodium and potassium nitrilotriacetates, as well as sodium and potassium tartrate mono- and di-succinates. Also useful are gluconate or glucoheptonate salts particularly sodium gluconate and sodium glucoheptonate. Particularly advantageously used are di-, tri- and tetra-sodium salts of -ethylenediaminetetraacetic acid, especially tetrasodium salts thereof. As noted, these organic builder salts may be used individually, as a combination of two or more organic builder salts, as well as in conjunction with one or more detergency builders, including those indicated above. It is also to be appreciated that

many of these constituents which are useful as builders often also provide a beneficial pH adjusting effect.

Examples of non-aqueous solvents which can be used in minor amounts in the inventive compositions include those which are at least partially water-miscible such as alcohols, (e.g., low molecular weight alcohols, such as, for example, ethanol, propanol, isopropanol, and the like), glycols (such as, for example, ethylene glycol, propylene glycol, hexylene glycol, and the like), water-miscible ethers (e.g. diethylene glycol diethylether, diethylene glycol dimethylether, propylene glycol dimethylether), water-miscible glycol ether (e.g. propylene glycol monomethylether, propylene glycol mono ethylether, propylene glycol monopropylether, propylene glycol monobutylether, propylene glycol monohexyl ether, ethylene glycol monobutylether, dipropylene glycol monomethylether, dipropylene glycol monobutylether, diethyleneglycol monobutylether), lower esters of monoalkylethers of ethyleneglycol or propylene glycol (e.g. propylene glycol monomethyl ether acetate) all commercially available such as from Union Carbide (Danbury, CT), Dow Chemical Co. (Midland, MI) or Hoechst (Germany). Mixtures of several organic solvents can also be used.

Preferred non-aqueous solvents which can be used in minor amounts in the inventive compositions are glycol ethers. Exemplary useful glycol ethers are those having the general structure Ra-O-Rb-OH, wherein Ra is an alkyl of 1 to 20 carbon atoms, or an aryl of at least 6 carbon atoms, and Rb is an alkylene of 1 to 8 carbons or is an ether or polyether containing from 2 to 20 carbon atoms. Exemplary glycol ethers include propylene glycol methyl ether, dipropylene glycol methyl ether, tripropylene glycol methyl ether, propylene glycol isobutyl ether, ethylene glycol methyl ether, ethylene glycol ethyl ether, ethylene glycol butyl ether, diethylene glycol phenyl ether, propylene glycol phenol ether, dipropylene glycol monobutyl ether and mixtures thereof Specific examples of more preferred glycol ether solvents include propylene glycol methyl ether, dipropylene glycol methyl ether, tripropylene glycol methyl ether, propylene glycol isobutyl ether, ethylene glycol methyl ether, ethylene glycol ethyl ether, ethylene glycol butyl ether, diethylene glycol phenyl ether, propylene glycol phenol ether, and mixtures thereof Particularly preferred solvents are described in the Examples.

Examples of other antimicrobial/germicidal agents which may be present in minor amounts in the inventive compositions of the present application include, in addition to the germicidal cationic surfactants mentioned above, pyrithiones especially the zinc complex (Zpt), Octopirox®, dimethyldimethylol hydantoin (Glydant®) methylchloroisothiazolinone/methylisothiazolinone (Kathon CG®), benzoic acid, benzoyl peroxide, salicylamides, picric acid, xylenol, pyrocatechol, pyrogallol, phloroglucin, sodium sulfite, sodium bisulfite, imidazolidinyl urea (Germall 115®), diazolidinyl urea (Germaill II®), benzyl alcohol, 2-bromo-2-nitropropane-1,3-diol (Bronopol®), formalin (formaldehyde), iodopropenyl butylcarbamate (Polyphase P100®), chloroacetamide, methanamine, methyldibromonitrile glutaronitrile (1,2-dibromo-2,4-dicyanobutane or Tektamer®), glutaraldehyde, 5-bromo-5-nitro-1,3-dioxane (Bronidox®), phenethyl alcohol, o-phenylphenol/sodium o-phenylphenol, sodium hydroxymethylglycinate (Suttocide A®), polymethoxy bicyclic oxazolidine (Nuosept C®), dimethoxane, thimersal, dichlorobenzyl alcohol, captan, chlorphenenesin, hexachlorophene, tetrachlorophene, 2,3-dihydroxy-5,5'-dichlorodiphenyl sulfide, 2,2'-dihydroxy-3;3',5,5'-tetrachlorodiphenyl sulfide, 2,2'-dihydroxy-3,5',5,5',6,6'-hexachlorodiphenyl sulfide, and 3,3'-dibromo-5,5'-dichloro-2,2'-dihydroxydiphenylamine, dichlorophene, chlorbutanol, glyceryl laurate, halogenated diphenyl ethers, 2,4,4'-trichloro-2'-hydroxy-diphenyl ether (Triclosan(® or TCS), 2,2'-dihydroxy-5,5'-dibromo-diphenyl ether, phenolic compounds, phenol, 2-methyl phenol, 3-methyl phenol, 4-methyl phenol, 4-ethyl phenol, 2,4-dichlorophenol, p-nitrophenol,2,4-dimethyl phenol, 2,5-dimethyl phenol, 3,4-dimethyl phenol, 2,6-dimethyl phenol, 4-n-propyl phenol, 4-n-butyl phenol, 4-n-amyl phenol, 4-tert-amyl phenol, 4-n-hexyl phenol, 4-n-heptyl phenol, mono- and poly-alkyl and aromatic halophenols, p-chlorophenol, methyl p-chlorophenol, ethyl p-chlorophenol, n-propyl p-chlorophenol, n-butyl p-chlorophenol, n-amyl p-chlorophenol, sec-amyl p-chlorophenol, n-hexyl p-chlorophenol, cyclohexyl p-chlorophenol, n-heptyl p-chlorophenol, n-octyl p-chlorophenol, o-chlorophenol, methyl o-chlorophenol, ethyl o-chlorophenol, n-propyl o-chlorophenol, n-butyl o-chlorophenol, n-amyl o-chlorophenol, tert-amyl o-chlorophenol, n-hexyl o-chlorophenol, n-heptyl o-chlorophenol, o-benzyl p-chlorophenol, o-benzyl-m-methyl p-chlorophenol, o-benzyl-m, m-dimethyl p-chlorophenol, o-phenylethyl p-chlorophenol, o-phenylethyl-m-methyl p-chlorophenol, 3-methyl p-chlorophenol, 3,5-dimethyl p-chlorophenol, 6-ethyl-3-methyl p-chlorophenol, 6-n-propyl-3-methyl p-chlorophenol, 6-iso-propyl-3-methyl p-chlorophenol, 2-ethyl-3,5-dimethyl p-chlorophenol, 6-sec-butyl-3-methyl p-chlorophenol, 2-iso-propyl-3,5-dimethyl p-chlorophenol, 6-

diethylmethyl-3-methyl p-chlorophenol, 6-iso-propyl-2-ethyl-3-methyl p-chlorophenol, 2-sec-amyl-3,5-dimethyl p-chlorophenol, 2-diethylmethyl-3,5-dimethyl p-chlorophenol, 6-sec-octyl-3-methyl p-chlorophenol, o-benzylphenol, p-chloro-o-benzylphenol, 4-phenolsulfonic acid cresols (o-, m-, p-), p-chloro-m-cresol, p-bromophenol, methyl p-bromophenol, ethyl p-bromophenol, n-propyl p-bromophenol, n-butyl p-bromophenol, n-amyl p-bromophenol, sec-amyl p-bromophenol, n-hexyl p-bromophenol, cyclohexyl p-bromophenol, o-bromophenol, tert-amyl o-bromophenol, n-hexyl o-bromophenol, n-propyl-m,m-dimethyl o-bromophenol, 2-phenyl phenol, 4-chloro-2-methyl phenol, 4-chloro-3-methyl phenol, 4-chloro-3,5-dimethyl phenol, 2,4-dichloro-3,5-dimethylphenol, 3,4,5,6-terabromo-2-methylphenol, 5-methyl-2-pentylphenol, 4-isopropyl-3-methylphenol, para-chloro-meta-xylenol, chlorothymol, phenoxyethanol, phenoxyisopropanol, 5-chloro-2-hydroxydiphenylmethane, resorcinol and its derivatives, resorcinol, methyl resorcinol, ethyl resorcinol, n-propyl resorcinol, n-butyl resorcinol, n-amyl resorcinol, n-hexyl resorcinol, n-heptyl resorcinol, n-octyl resorcinol, n-nonyl resorcinol, phenyl resorcinol, benzyl resorcinol, phenylethyl resorcinol, phenylpropyl resorcinol, p-chlorobenzyl resorcinol, 5-chloro 2,4-dihydroxydiphenyl methane, 4'-chloro 2,4-dihydroxydiphenyl methane, 5-bromo 2,4-dihydroxydiphenyl methane, 4'-bromo 2,4-dihydroxydiphenyl methane, bisphenolic compounds, 2,2'-methylene bis(4-chlorophenol), 2,2'-methylene bis(3,4,6-trichlorophenol), 2,2'-methylene bis(4-chloro-6-bromophenol), bis(2-hydroxy-3,5-dichlorophenyl) sulphide, bis(2-hydroxy-5-chlorobenzyl)sulphide, benzoic esters parabens such as methylparaben, propylparaben, butylparaben, ethylparaben, isopropylparaben, isobutylparaben, benzylparaben, sodium methylparaben, sodium propylparaben, halogenated carbanilides, 3,4,4'-trichlorocarbanilides (Trichlocarban® or TCC), 3-trifluoromethyl-4,4'-dichlorocarbanilide, and 3,3',4-trichlorocarbanilide.

Other antimicrobial/germicidal agents which may be present in minor amounts in the inventive compositions of the present application also include the so-called "natural" antibacterial actives, referred to as natural oils. These actives derive their names from their natural occurrence in plants. Typical natural essential oil antibacterial actives include oils of anise, citrus, aniseed, roses, mint, camphor, lemon, orange, rosemary, wintergreen, thyme, lavender, cloves, hops, tea tree, citronella, wheat, barley, lemongrass, cedar leaf, cedarwood, cinnamon, fleagrass, geranium, sandalwood, violet, cranberry, eucalyptus, vervain, peppermint, gum benzoin, basil, fennel, fir, balsam,

menthol, ocmea origanum, hydastis carradensis, berberidaceae daceae, ratanhiae and curcuma longa. Also included in this class of natural essential oils are the key chemical components of the plant oils which have been found to provide the antimicrobial benefit. These chemicals include, but are not limited to anethol, catechole, camphene, pinocarvone, cedrol, thymol, eugenol, eucalyptol, ferulic acid, farnesol, hinokitiol, tropolone, limonene, menthol, methyl salicylate, carvacol, terpineol, verbenone, berberine, ratanhiae extract, caryophellene oxide, citronellic acid, curcumin, nerolidol and geraniol. Additional antimicrobial/germicidal agents which may be present in minor amounts in the inventive compositions of the present application also include antimicrobial metal salts. This class generally includes salts of metals in groups 3b-7b, 8 and 3a-5a. Specifically are the salts of aluminum, zirconium, zinc, silver, gold, copper, lanthanum, tin, bismuth, selenium, strontium, scandium, yttrium, cerium, praseodymiun, neodymium, promethum, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium and mixtures thereof.

Additional other antimicrobial/germicidal agents which may be present in minor amounts in the inventive compositions of the present application also include oxidizers, for example hydrogen peroxide, peracids and their salts; bleach based actives, for example, sodium hypochlorite; organic acids, for example, formic, citric, glycolic, maleic, malic, lactic, glutaric, succinic, benzoic; and aldehydes, for example, glutaraldehyde, succinaldehyde

The other optional additives which can be added in minor amounts, such as coloring agents, fragrances and fragrance solubilizers, viscosity modifying agents, pH adjusting agents and pH buffers including organic and inorganic salts, optical brighteners, opacifying agents, hydrotropes, antifoaming agents, enzymes, anti-spotting agents, anti-oxidants, and anti-corrosion agents are well known to those skilled in the art as is their use and selection.

As is noted above, the compositions according to the invention are aqueous in nature. Water is added to the constituents in order to provide 100% by weight of the composition. The water may be tap water, but is preferably distilled and is most preferably deionized water. If the water is tap water, it is preferably substantially free of any undesirable impurities such as organics or inorganics, especially mineral salts which

are present in hard water which may thus interfere with the operation of one or more of the constituents of the aqueous compositions according to the invention. Preferably the concentrate compositions comprise the least amount of water possible, if not water-free.

Such materials described above are known to the art, including those described in *McCutcheon's Emulsifiers and Detergents (Vol. 1),* North American Edition, 2000; *Kirk-Othmer, Encyclopedia of Chemical Technology,* 4th Ed., Vol. 23, the contents of which are herein incorporated by reference.

The compositions according to the invention are useful in the disinfecting and/or cleaning of surfaces, especially hard surfaces in need of such treatment. These in particular include surfaces wherein the presence of gram positive and/or gram negative bacteria are suspected. In accordance with the present inventive process, cleaning and/or disinfecting of such surfaces comprises the step of applying a stain releasing and a disinfecting effective amount of a composition as taught herein to such a stained surface. Afterwards, the compositions are optionally but desirably wiped, scrubbed or otherwise physically contacted with the hard surface, and further optionally, may be subsequently rinsed from such a cleaned and disinfected hard surface.

Such a hard surface cleaning and disinfecting composition according to the invention is may be provided as a ready to use product which may be directly applied to a hard surface, but is desirably provided in a concentrated form intended to be diluted in water to form a cleaning composition therefrom.

By way of example, hard surfaces include surfaces composed of refractory materials such as: glazed and unglazed tile, porcelain, ceramics as well as stone including marble, granite, and other stones surfaces; glass; metals; plastics e.g. polyester, vinyl; fiberglass, Formica®, Corian® and other hard surfaces known to the industry. Hard surfaces which are to be particularly denoted are lavatory fixtures such as shower stalls, bathtubs and bathing appliances (racks, shower doors, shower bars) toilets, bidets, wall and flooring surfaces especially those which include refractory materials and the like. Further hard surfaces which are to be denoted are those associated with kitchen environments and other environments associated with food preparation, including cabinets and countertop surfaces as well as walls and floor

surfaces especially those which include refractory materials, plastics, Formica®, Corian® and stone.

The hard surface cleaner composition provided according to the invention can be also be provided as a ready to use product in a manually operated spray dispensing container. Such a typical container is generally made of synthetic polymer plastic material such as polyethylene, polypropylene, polyvinyl chloride or the like and includes spray nozzle, a dip tube and associated pump dispensing parts and is thus ideally suited for use in a consumer "spray and wipe" application. In such an application, the consumer generally applies an effective amount of the cleaning composition using the pump and within a few moments thereafter, wipes off the treated area with a rag, towel, or sponge, usually a disposable paper towel or sponge. In certain applications, however, especially where undesirable stain deposits are heavy, the cleaning composition according to the invention may be left on the stained area until it has effectively loosened the stain deposits after which it may then be wiped off, rinsed off, or otherwise removed. For particularly heavy deposits of such undesired stains, multiple applications may also be used.

In a yet a further embodiment, the compositions according to the invention may be formulated so that it may be useful in conjunction with a "aerosol" type product wherein it is discharged from a pressurized aerosol container. If the inventive compositions are used in an aerosol type product, it is preferred that corrosion resistant aerosol containers such as coated or lined aerosol containers be used. Such are preferred as they are known to be resistant to the effects of basic formulations. Known art propellants such as liquid propellants as well as propellants of the non-liquid form, i.e., pressurized gases, including carbon dioxide, air, nitrogen, hydrocarbons as well as others may be used. Also, while satisfactory for use, fluorocarbons may be used as a propellant but for environmental and regulatory reasons their use is preferably avoided. In such an embodiment, the cleaning composition is dispensed by activating the release nozzle of said aerosol type container onto the stain and/or stain area, and in accordance with a manner as above-described a stain is treated and removed.

Whereas the present invention is intended to be used in the types of liquid forms described, the compositions according to the invention are desirably diluted with a

further amount of water to form a cleaning and disinfecting solution therefrom. In such a proposed diluted cleaning solution, the greater the proportion of water added to form said cleaning dilution, the greater may be the reduction of the rate and/or efficacy of the thus formed cleaning solution in the cleaning of a hard surface, as well as a reduction in disinfectant efficacy. Accordingly, longer residence times upon the stain to effect their loosening and/or the usage of greater amounts may be necessitated. Conversely, nothing in the specification shall be also understood to limit the forming of a "super-concentrated" cleaning composition based upon the composition described above. Such a super-concentrated composition is essentially the same as the compositions described above except in that they include a lesser amount of water.

While the cleaning compositions are most beneficial for use in their form, i.e., their form as described above, they may also be diluted to form a cleaning composition therefrom. Such cleaning compositions may be easily prepared by diluting measured amounts of a concentrated composition which is an object of the present invention in further amounts of water by the consumer or other end user in certain weight ratios of composition: water, and optionally, agitating the same to ensure even distribution of the composition in the water. The concentrate compositions according to the invention may be used without further dilution, but may also be used with a further aqueous dilution, i.e., in concentrate composition: water concentrations of 1:0, to extremely dilute dilutions such as 1:1000. When subjected to further aqueous dilution, such a dilution is preferably a weight or volume ratio proportion of from 1:10-1:128, and most desirably is about 1:64. The actual dilution selected is in part determinable by the degree and amount of dirt and grime to be removed from a surface(s), the amount of mechanical force imparted to remove the same, as well as the observed efficacy of a particular dilution. Generally better results and faster removal is to be expected at lower relative dilutions of the composition and the water.

The concentrated compositions of the present invention are ideally formulations wherein the amounts of components, excluding water, are concentrated five, ten, fifteen, twenty or even twenty-five fold such that when the concentrated compositions are diluted in water for further use, the amounts of cationic surfactant and short chain non-ionic are present in the diluted form in the amounts set forth hereinbelow.

The concentrated compositions of the present invention can be supplied in liquid form in bottles which are then added to the desired amount of water. Additionally, the concentrated compositions can be supplied in the form of sachets having a water dissolvable film covering, for example, polyvinyl alcohol, such that when the sachet is placed in a quantity of water, the polyvinyl alcohol dissolves, releasing the concentrated composition into the water, forming a dilutable composition. Preferably, the polyvinyl alcohol sachet is soluble in water of varying temperatures so to be useful in both cold water and warm water dilutions.

Figure 1 shows the effects of nonionic surfactants on antimicrobial efficacy of quaternary ammonium compound against *Salmonella choleraesuis*. For solutions containing 450 ppm quaternary ammonium compound, short chain non-ionics with alkyl chain lengths of 10 or shorter did not reduce antimicrobial efficacy of quaternary ammonium compound against *Salmonella choleraesuis* at short chain non-ionic concentrations as high as 1000 ppm. This compares to a drop in quaternary ammonium compound efficacy of almost 4 logs at 1000 ppm of a C_{12-16} ethoxylated alcohol non-ionic. For the C_{11} nonionic, a smaller decrease of 3 logs in quaternary ammonium compound efficacy is observed. At a quaternary ammonium compound concentration of 210 ppm, the same trend is observed as short chain non-ionic surfactants with alkyl chain lengths of 10 or shorter do not have any effect on quaternary ammonium compound antimicrobial efficacy. The C_{11} nonionic results in a smaller decrease, while the C_{12-16} ethoxylated alcohol non-ionic cause a larger decrease.

The data contained in Figure 1 demonstrate that ethoxylated alcohol nonionic surfactants with alkyl chain lengths of 10 or less have minimal impact, and those with chain lengths of 11 have reduced impact on the antimicrobial efficacy of quaternary ammonium compounds. This compares to a greater impact on the antimicrobial efficacy of quaternary ammonium compound when used with a C_{12} and longer chain non-ionic.

Representative short chain non-ionics evaluated in Figure 1 are Alfonic 610-3.5 [C_6-C_{10}] from Condea Vista (◊); Alfonic 810-4.5 [C_8-C_{10}] from Condea Vista (△); Genapol UD-79 [C_{11}] from Clariant (▽); and Genapol 26-L-50 [C_{12}-C_{16}] from Clariant ( ). The quaternary ammonium compound evaluated was BTC-8358 (alkyl dimethyl benzyl ammonium chloride (80% active) from Stepan).

Samples for Figure 1 were evaluated for antimicrobial activity using the Biomek® 2000 Laboratory Automation Workstation together with the BioWorks Operating System (available from Beckman Coulter Inc., Fullerton, CA). The organism tested was *Salmonella choleraesuis* at an in test average concentration of 1.4 - 2.0 x 10^9 organisms/20 microliters (9log titer). The Biomek method measures the recovery of bacteria in suspension. One part of organism suspension (*Salmonella choleraesuis*) is added to 9 parts of each sample in an appropriate container. Deionized water (DI H_2O) was used a control. The organism and sample are then mixed thoroughly for 15 seconds. Serial tenfold dilutions are carried out in a neutralizing broth. The diluted samples are then incubated for 24-48 hours at 35-37°C. Thereafter, surviving organisms are quantified and log reduction, as a measurement of organism survivors are calculated as follows:

Log Reduction = (Log Survivors/DI H_2O Control)-(Log Survivors/Sample)

The following examples below illustrate exemplary and preferred formulations of compositions according to the instant invention. It is to be understood that these examples are presented by means of illustration only and that further useful formulations fall within the scope of this invention and the claims may be readily produced by one skilled in the art and not deviate from the scope and spirit of the invention.

Throughout this specification and in the accompanying claims, weight percents of any constituent are to be understood as the weight percent of the active portion of the referenced constituent, unless otherwise indicated.

EXAMPLE FORMULATIONS

Preparation of Example Formulations:

Exemplary formulations illustrating certain preferred embodiments of the inventive compositions and described in more detail in Table 1 below were formulated generally in accordance with the following protocol. The indicated weight percentages

are of the named constituent "as supplied" from its respective supplier. For the dye, the percent actives are shown in parenthesis for the particular formulation.

Into a suitably sized vessel, a measured amount of water was provided after which the constituents were added in no specific or uniform sequence, which indicated that the order of addition of the constituents was not critical. All of the constituents were supplied at room temperature, and any remaining amount of water was added thereafter. Certain of the nonionic surfactants if gels at room temperature were first preheated to render them pourable liquids prior to addition and mixing. Mixing of the constituents was achieved by the use of a mechanical stirrer with a small diameter propeller at the end of its rotating shaft. Mixing, which generally lasted from 5 minutes to 120 minutes was maintained until the particular exemplary formulation appeared to be homogeneous. The exemplary compositions were readily pourable, and retained well mixed characteristics (i.e., stable mixtures) upon standing for extend periods. The compositions of the example formulations are listed on Tables 1 and 2. Examples of concentrated compositions which are suitable for dilution within the scope of this invention are shown in Tables 1 and 2. The various components used in Tables 1 and 2 are identified in Table 3.

Table 1

Components	Comp1	Ex1	Ex2	Ex3	Ex4	Ex5	Ex6
BTC 1010		1.580			6.000	6.000	6.000
BTC 8358	1.482		0.960	1.482			
Alfonic 810-4.5		1.500	1.500	1.500	2.500	2.500	2.500
Genapol 26-L-60	2.730						
Glucopon 325	3.636						
Pluronic PE6400	1.818				1.500	1.500	
Na_4 EDTA	0.227						
Borax	0.091						
Na_2CO_3		0.200	0.200	0.200	0.250	0.250	0.250

$NaHCO_3$		0.100	0.100	0.100	0.250	0.250	0.250
NaOH				0.864			
KOH					0.389	0.389	0.389
Fragrance	0.182			0.182	0.450	0.350	0.450
Dye	0.182 (3%)			0.182 (3%)	0.450(1%)	0.006	0.450(1%)
D.I. Water	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.

5

Table 2

Components	Ex7	Ex8	Ex9	Ex10
BTC 1010		39.5		
BTC 8358	37.05		24.0	37.05
Alfonic 810-4.5	37.5	37.5	37.5	37.5
Na_2CO_3	5.0	5.0	5.0	5.0
$NaHCO_3$	2.5	2.5	2.5	2.5
NaOH	9.0	9.0	9.0	5.4
Fragrance	7.5	7.5	7.5	4.55
Dye	0.1	0.1	0.1	4.55 (3%)
D.I. Water	q.s.	q.s.	q.s.	q.s.

10

Table 3

Component	Description
BTC 1010	didecyl dimethyl ammonium chloride (50% active) Stepan
BTC 8358	alkyl dimethyl benzyl ammonium chloride (80% active) Stepan
Alfonic 810-4.5	C_8 -C_{10} straight-chain alcohols ethoxylated with about 4.85 moles of ethylene oxide (Condea Vista)
Genapol 26-L-60	C_{12-16} primary alcohol ethoxylate having cloud point of ~60 C (1.0 wt. % in water). Clariant
Glucopon 325	C_{9-11} alkyl polyglycoside. Cognis
Pluronic PE6400	EO/PO block copolymer BASF AG (also available as Pluronic L64)
Na_4 EDTA	Tetrasodium ethylenediaminetetraacetate
Borax	Hydrated sodium borate

Na_2CO_3	Sodium carbonate
$NaHCO_3$	Sodium bicarbonate
NaOH	Sodium hydroxide (25% solution)
KOH	Potassium hydroxide (45% solution)
Fragrance	Proprietary blend
Dye	Proprietary blend
D.I. Water	Deionized water

Antimicrobial efficacy of Ex1 and Ex2 were evaluated generally in accordance with the standardized AOAC Use-Dilution test method based on AOAC Official Methods of Analysis Procedures 955.14 "Testing disinfectants against *Salmonella Choleraesusis*," and Procedure 955.15 "Testing disinfectants against *Staphylococcus Aureus*" (15th Edition, 1990, pages 135-137, Use Dilution Methods). The results reported on Table 4 indicate the proportion of the number of carriers within which the organism remained alive after 10 minutes of exposure at 20°C. over the total number of carriers used in testing. Samples of Ex1 and Ex2 were diluted 1 part to 40 parts water prior to testing. Both examples show disinfectant activity.

Table 4

	Ex1	Ex2
Salmonella choleraesuis	0/30	0/30
Staphylococcus aureus	1/30	0/30

The eye toxicity of inventive formulations which are the subject of the present application were evaluated using the Draize eye test. The response measured was the time in days needed to produce a zero Draize score. Analysis of the results showed a significant nonionic type by quaternary ammonium compound level interaction, thus indicating the effect of increasing quaternary ammonium compound level on eye toxicity was different when short chain non-ionic surfactants were present in the formulation than when non-short chain non ionic surfactants were present, at equal weight percents. Specifically, the average effect of raising the quaternary ammonium compound level from its 'low' level to its 'high' level when a non-short chain non ionic surfactant was present was a 3.1X increase in the time required to reach zero Draize score versus only a 1.4X increase when a short chain non ionic surfactant was present.

Cleaning evaluation of formulation Ex3 was compared to Comp1 in accordance with the testing protocol outlined according to ASTM D4488 A2 Test Method, which evaluated the efficacy of the cleaning compositions on masonite wallboard samples painted with wall paint. The soil applied was a greasy soil sample containing vegetable oil, food shortening and animal fat. The sponge (water dampened) of a Gardner Abrasion Tester apparatus was squirted with a 15 gram sample of a tested cleaning composition, and the apparatus was cycled 10 times. The evaluation of cleaning compositions was "paired" with one side of each of the test samples treated with a composition according to the invention, and the other side of the same sample treated with a comparative example's composition, thus allowing a "side-by-side" comparison to be made. Each of these tests were duplicated on 20 wallboard tiles and the results statistically analyzed. The cleaning efficacy of the tested compositions was evaluated utilizing a Minolta Chroma Meter CF-110, with Data Processor DP-100, which evaluated spectrophotomic characteristics of the sample.

Also, cleaning evaluation of formulation Ex3 was compared to Comp1 in accordance with the testing protocol outlined according to ASTM D-4488-89 Annex A5 for particulate soil, which evaluated the efficacy of the cleaning compositions on vinyl tile samples. The soil applied was a particulate soil sample containing natural humus, paraffin oil, used crankcase motor oil, Portland cement, silica, lampblack carbon, iron oxide, bandy black clay, stearic acid, and oleic acid. Each of the soiled test vinyl tile samples (two samples) were placed into the apparatus and the center of each tile was wetted with a 20 ml sample of a test formulation and allowed to stand for 1 minute. When approximately 30 seconds had elapsed, a further 50 ml sample was applied to the sponge (water damped, then wrung to remove excess water) of a Gardner Abrasion Tester apparatus. The apparatus was then cycled 10 times, which provided 20 strokes of the sponge across the face of each of the vinyl test tiles. The reflectance values of the cleaned samples were evaluated utilizing a Minolta Chromameter CF-110, with Data Processor DP-100, which evaluated spectrophotomic characteristics of the sample.

In testing the cleaning efficacy of Ex3 to Comp1 under ASTM D-4488 Annex A2 and D-4488-89 Annex A5, Ex3 was at parity or better than Comp1 when tested either full strength or diluted at 1:16 or 1:32 (Ex3 or Comp1:water).

Claims:

1. An aqueous composition, comprising:

at least one cationic surfactant having germicidal properties;

at least one non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant;

optionally, up to about 5% wt. of one or more conventional additives selected from coloring agents, fragrances and fragrance solubilizers, viscosity modifying agents, other non-short chain non-ionic surfactants, other antimicrobial/germicidal agents, pH adjusting agents and pH buffers including organic and inorganic salts, non-aqueous solvents, optical brighteners, opacifying agents, hydrotropes, antifoaming agents, enzymes, anti-spotting agents, anti-oxidants, and anti-corrosion agents; and,

water to form 100% wt. of said composition.

2. The composition of claim 1 wherein the at least one cationic surfactant having germicidal properties is present in an amount of from about 0.001 to about 10% wt.

3. The composition of claim 2 wherein the at least one non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant is present in an amount of from about 0.01 to about 10% wt.

4. The composition of claim 3 wherein the non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant is selected from C_6 -C_{11} linear alcohol ethoxylate having from about 1 to about 6 moles of ethylene oxide.

5. The composition of claim 4 wherein the C_6 -C_{11} linear alcohol ethoxylate having from about 1 to about 6 moles of ethylene oxide is present in an amount of from about 0.1%-6% wt.

6. The composition according to claim 5 wherein the C_6 -C_{11} linear alcohol ethoxylate having from about 1 to about 6 moles of ethylene oxide is present in an amount of from about 0.1%-3% wt.

7. The composition of claim 1 which is in a ready to use form.

8. The composition of claim 1 which is in concentrate form.

9. An aqueous composition which comprises 1 part of the aqueous disinfecting and cleaning composition of claim 1 per 10 to 128 parts water.

10. A process for cleaning and/or disinfecting of hard surfaces which comprises the step of:

applying an effective amount of a composition according to claim 1 to the surface.

11. An aqueous composition which consists essentially of:

at least one cationic surfactant having germicidal properties;

at least one non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant;

optionally, up to about 5% wt. of one or more conventional additives selected from coloring agents, fragrances and fragrance solubilizers, viscosity modifying agents, other non-short chain non-ionic surfactants, other antimicrobial/germicidal agents, pH adjusting agents and pH buffers including organic and inorganic salts, non-aqueous solvents, optical brighteners, opacifying agents, hydrotropes, antifoaming agents, enzymes, anti-spotting agents, anti-oxidants, and anti-corrosion agents ; and,

water to form 100% wt. of said composition.

12. The composition of claim 11 wherein the at least one cationic surfactant having germicidal properties is present in an amount of from about 0.001 to about 10% wt.

13. The composition of claim 12 wherein the at least one non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant is present in an amount of from about 0.01 to about 10% wt.

14. The composition of claim 13 wherein the non-ionic surfactant having from six to eleven carbon atoms in the non-polar hydrophobic portion of the surfactant is selected from C_6 -C_{11} linear alcohol ethoxylate having from about 1 to about 6 moles of ethylene oxide.

15. The composition of claim 14 wherein the C_6 -C_{11} linear alcohol ethoxylate having from about 1 to about 6 moles of ethylene oxide is present in an amount of from about 0.1%-6% wt.

16. The composition according to claim 15 wherein the C_6 -C_{11} linear alcohol ethoxylate having from about 1 to about 6 moles of ethylene oxide is present in an amount of from about 0.1%-3% wt.

17. The composition of claim 16 which is in a ready to use form.

18. The composition of claim 16 which is in concentrate form.

19. An aqueous composition which comprises 1 part of the aqueous disinfecting and cleaning composition of claim 18 per 10 to 128 parts water.

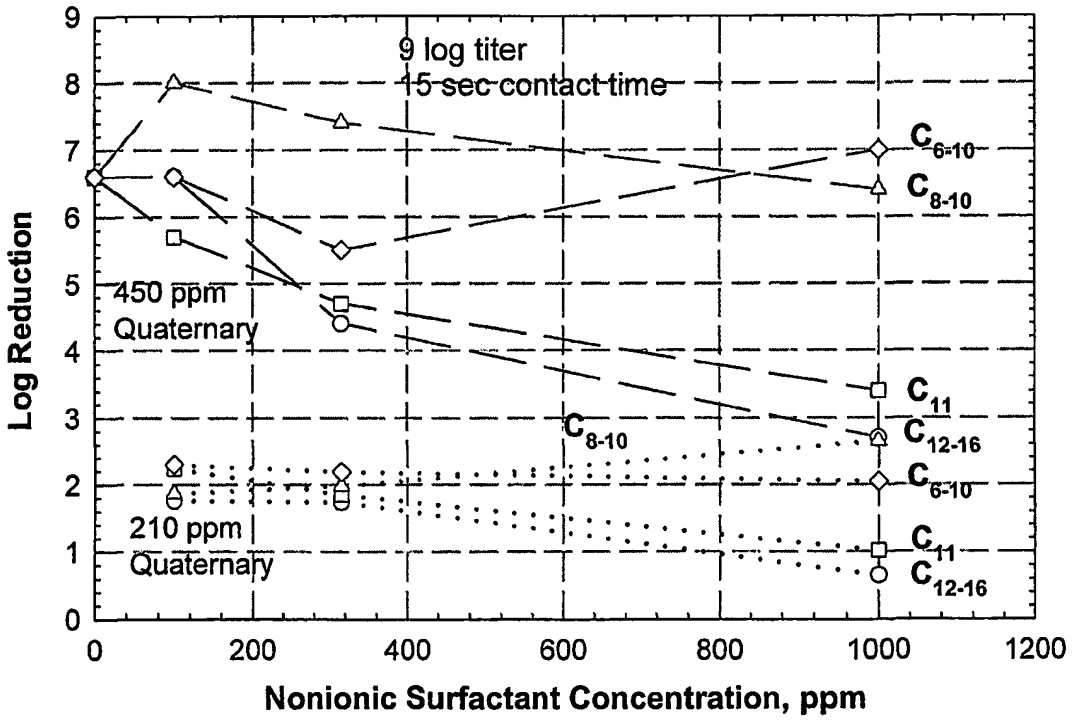


Figure 1. Effect of nonionic surfactants on the efficacy of benzalkonium chloride quaternary vs *Salmonella choleraesuis*